CLAIMS

1. A method of forming a coating on a substrate comprising:

depositing a coating on a substrate with a solution comprising a resin molecule containing at least 2 Si-H groups, at least 2 Si-CH_3 groups, or a combination thereof, and a solvent in a manner in which at least about 5 volume % of the solvent remains in the coating after deposition;

exposing the coating to UV radiation at a power and wavelength spectrum sufficient to cause hydrolysis of the Si-H groups, Si-CH_3 groups, or combination thereof, and at least partial condensation; and

evaporating the solvent from the coating to form a porous network coating.

2. The method of claim 1 wherein the resin molecule containing at least 2 Si-H groups has the formula:

$$\{R_3SiO_{1/2}\}_a \{R_2SiO_{2/2}\}_b \{RSiO_{3/2}\}_c \{SiO_{4/2}\}_d$$

wherein each R is independently selected from the group consisting of hydrogen, alkyl, alkenyl, and aryl groups or alkyl, alkenyl, and aryl groups substituted with halogen, nitrogen, oxygen, sulfur or silicon atoms, with the proviso that at least 2 R groups are hydrogen.

3. The method of claim 2 wherein the resin molecule comprises a hydrogen silsesquioxane resin molecule of the structure selected from the group consisting of $(HSiO_{3/2})_n$, a polymer having units of the formula $HSi(OH)_a O_{3-x/2}$, or a polymer having units of the formula $HSi(OH)_x(OR)_yO_{z/2}$, wherein each R is independently an organic group which, when bonded to silicon through the oxygen atom, forms a hydrolyzable substituent, a=0 to 2, x=0 to 2, y=0 to 2, z=1 to 3, x+y+z=3, n is an integer greater than 3 and the average value of y over all of the units of the polymer is greater than 0.

4. The method of claim 1 wherein the solvent is selected from the group consisting of alcohols, aromatic hydrocarbons, alkanes, alkenes, ketones, esters, ethers, or mixtures thereof and is present in an amount sufficient to dissolve the resin molecule to between about 0.1 and about 95 weight percent.

5. The method of claim 4 wherein the solvent has a boiling point greater than or about 175°C.

6. The method of claim 4 wherein the solvent is a mixture of solvents and at least one of the solvents has a boiling point greater than or about 175°C.

7. The method of claim 5 wherein the solvent with a boiling point greater than or about 175°C is a hydrocarbon.

8. The method of claim 6 wherein the solvent with a boiling point greater than or about 175°C is a hydrocarbon.

9. The method of claim 1 wherein the substrate is coated in a closed environment to inhibit evaporation of the solvent.

10. The method of claim 1 wherein the coating is exposed to UV radiation for up to about 600 seconds.

11. The method of claim 1 wherein the substrate has a wafer temperature that is maintained initially at about room temperature to ensure that hydrolysis and at least partial condensation of the Si-H groups, $Si-CH_3$ groups, or combination thereof, has occurred before the solvent has been evaporated.

12. The method of claim 1 wherein the coating is exposed to UV radiation at a process pressure that is less than or about equal to atmospheric pressure.

13. The method of claim 1 wherein the coating is exposed to UV radiation at a process pressure that is greater than or about equal to atmospheric pressure.

14. The method of claim 1 wherein the coating is exposed to UV radiation at a UV power between about 0.1 and about 1000 mW/cm^2.

15. The method of claim 1 wherein the coating is exposed to UV radiation with a gas purge selected from the group consisting of oxygen gas and oxygen-containing gas.

16. The method of claim 1 wherein the coating is exposed to UV radiation using a UV wavelength spectrum that is less than or about 400nm.

17. A porous network coating prepared by the method of claim 1.

18. A substrate having a porous network coating prepared by the method of claim 1.

19. An electronic device containing a porous network coating prepared by the method of claim 1.

20. An ammonia-free process for forming a coating on a substrate comprising:

depositing a coating on a substrate with a solution comprising a resin molecule containing at least 2 Si-H groups, at least 2 $Si-CH_3$ groups, or a combination thereof, and a solvent in a manner in which at least about 5 volume % of the solvent remains in the coating after deposition;

gelating the resin without the use of ammonia by exposing the coating to UV radiation at a power and wavelength spectrum sufficient to cause hydrolysis of the Si-H groups, $Si-CH_3$ groups, or combination thereof, and at least partial condensation; and

evaporating the solvent from the coating to form a porous network coating.

21. The process of claim 20 wherein the coating is exposed to UV radiation for up to about 600 seconds.

22. The process of claim 20 wherein the substrate has a wafer temperature that is maintained initially at about room temperature to ensure that hydrolysis and at least

partial condensation of the Si-H groups, Si-CH_3 groups, or combination thereof, has occurred before the solvent has been evaporated.

23. The process of claim 20 wherein the coating is exposed to UV radiation at a process pressure that is less than or about equal to atmospheric pressure.

24. The process of claim 20 wherein the coating is exposed to UV radiation at a process pressure that is greater than or about equal to atmospheric pressure.

25. The process of claim 20 wherein the coating is exposed to UV radiation at a UV power between about 0.1 and about 1000 mW/cm^2.

26. The process of claim 20 wherein the coating is exposed to UV radiation with a gas purge selected from the group consisting of oxygen gas and oxygen-containing gas.

27. The process of claim 20 wherein the coating is exposed to UV radiation using a UV wavelength spectrum that is less than or about 400nm.